

How ancient wisdom shaped the development of modern science

Prof. Cornelis J. Schilt and the VERITRACE team
Vrije Universiteit Brussel

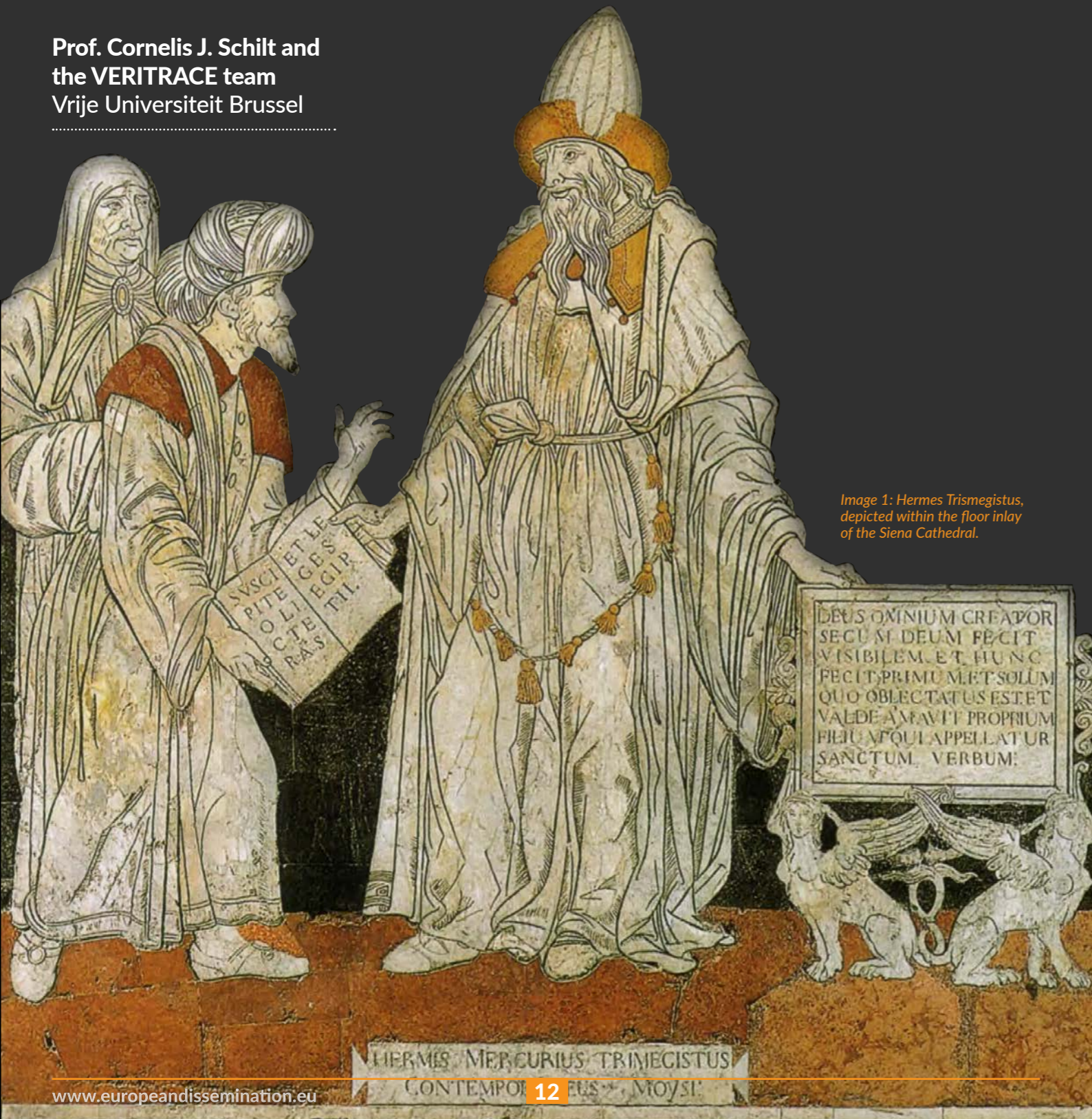


Image 1: Hermes Trismegistus, depicted within the floor inlay of the Siena Cathedral.

Using state-of-the-art digital analysis techniques on a large corpus of early modern texts.

Have you ever considered that knowledge may not be new but old? During the Italian Renaissance, this conception of knowledge became quite influential, fuelled by the rediscovery of texts like the *Corpus Hermeticum*, the *Chaldean Oracles*, the *Orphic Hymns* and the *Sibylline Oracles*, all understood to have been composed in antiquity. These texts, and the associated idea of knowledge as old, were reappropriated into a perennial philosophy, a *prisca sapientia*, which was a tradition that valued these works for their insights into God, mankind and the cosmos. Key figures in early modern science, such as Nicolaus Copernicus, Johannes Kepler, Francis Bacon, Isaac Newton and Gottfried Wilhelm Leibniz, ascribed to this tradition in one form or another. Yet no comprehensive account exists of exactly what these luminaries took from these ancient wisdom writings and how the concept of a perennial truth influenced their knowledge-making.

The ERC Starting Grant project VERITRACE, or “*Traces de la vérité: The reappropriation of ancient wisdom in early modern natural philosophy*”, aims to fill this gap in our understanding of the development of early modern science. It focuses on the widespread dissemination and impact of the ancient wisdom tradition, employing specialised digital techniques adapted for early modern studies.

VERITRACE anticipates significant breakthroughs in our understanding of the role of these ancient texts in early modern natural philosophy by pursuing three main objectives: creating a comprehensive roadmap of how ancient wisdom was incorporated into early modern science, charting the spread of this discourse from Renaissance Italy to early modern Europe, and identifying watershed moments in the reception and perception of these ancient wisdom writings.

Intellectual background

The Renaissance nurtured the development of new knowledge about mankind and the cosmos. It was an era marked by discoveries of new worlds, translations of ancient texts newly discovered, Gutenberg’s printing press and a shifting European politico-religious landscape, which facilitated the emergence of innovative ideas and theories.

Perhaps surprisingly, during this same period, a tradition that had its roots in antiquity developed. Known in its many guises as *prisca theologia*, *prisca sapientia* and *philosophia perennis*, it focussed not on new, but ancient knowledge, considered to be original truths revealed to mankind at the beginning of the world (Schmitt, 1966; Walker, 1972; Garin, 1984; Schmidt-Biggemann, 2004; Leinkauf, 2017).

These ancient doctrines, seemingly distant from modern science, were, in fact, eagerly studied by foundational natural philosophers, who in turn would shape modern physics, chemistry and mathematics.

Key texts such as the *Chaldean and Sibylline Oracles*, the *Corpus Hermeticum* and the *Orphic Hymns*, some of which were believed to be as old as the time of the patriarch Abraham, were rediscovered and reinterpreted by scholars like Georgios Gemistos Plethon, Marsilio Ficino, Giovanni Pico della Mirandola, Agostino Steuco and Francesco Patrizi. During the early modern period, Copernicus, Kepler, Bacon, and Newton were but four of the many natural philosophers who professed inspiration by this idea of an ancient



Image 2: Hermes Trismegistus with the Emerald Tablet as portrayed in an alchemical treatise.

knowledge, each in different ways, yet the extent of these ideas on the generation of new knowledge remains underexplored.

State-of-the-art approach

VERITRACE explores the impact of this idea of a perennial tradition on early modern natural philosophy primarily by tracing how four main corpora were read and discussed in the literature of the period. These corpora include all then-available editions of the *Corpus Hermeticum* (including the *Asclepius*), the *Chaldean Oracles*, the *Sybilline Oracles* and the *Orphic Hymns*. Printed books, connecting readers across Europe, offer a broader reach than the era's other modes of discourse, like oral discussions, manuscripts and the circulation of letters. Indeed, even if we only focus on works in Latin, English, German, French, Dutch and Italian, the number of books that have survived from the early modern period is staggering and representative of what was printed in the period. To analyse the influence of ancient wisdom writings and their Renaissance popularisers, VERITRACE employs digital distant reading techniques. This method, closely related to natural language processing, allows for the analysis of large text corpora, identifying patterns and uncovering both prominent and neglected works, the latter termed 'the great unread' by Margaret Cohen (Cohen,

2009; Reid, 2019). Famously, early modern writers would hardly include references, in particular to their source material, which provides one of the key challenges for the project.

Significant advancements in digitising early modern books have expanded the application of distant reading techniques. Improved OCR technology now yields meaningful results even with suboptimal text recognition (Hill and Hengchen, 2019; Kurhekar *et al.*, 2021). Online repositories, like those of the Bibliothèque nationale de France, provide standardised data for content extraction, facilitating large-scale analysis (Imai, 2018; Karsdorp *et al.*, 2021). In fact, Prof. Schilt has previously applied these kinds of techniques to analyse Isaac Newton's extensive manuscript archive.

The VERITRACE project integrates close and distant reading of Renaissance and early modern texts. The close reading corpus (CRC) includes all the relevant editions of the four main corpora under scrutiny that were published during the Renaissance and early modern period but also works that drew heavily on these ancient wisdom writings. These would have been used by natural philosophers both for the primary source materials they contain and for their incorporation in natural philosophical theories.

The distant reading corpus (DRC) consists of several hundred thousand works

from important European publication databases in Latin, French, German, Dutch, English, and Italian, including:

- early English Books Online (EEBO) (ProQuest), which in its EEBO-TCP format developed by the Text Creation Partnership, contains about 58000 English and Latin texts published between 1540 and 1700
- Gallica (Bibliothèque nationale de France), which contains almost 125000 books published between 1540 and 1728 in a variety of languages, including French, Italian, Dutch, and Latin
- the *Digitale Sammlungen* of the Bavarian State Library, which contains nearly 365000 titles published between 1540 and 1728, in Latin, German and French, among others.

Digital images and texts from these databases can be extracted using advanced APIs for comprehensive analysis. OCR corrections, if needed, are done using specialist tools like EMOP (<https://emop.tamu.edu>).

The primary analytical techniques deployed by the project involve so-called latent semantic analysis (LSA) and sentiment analysis. LSA, familiar from plagiarism software, compares text usage across the corpus, revealing unacknowledged influences and similarities (Foltz, 2011; Kintsch *et al.*, 2011; Ratna *et al.*, 2017; Dobson, 2019).

LSA will help detect the influence of particular authors upon one another and upon larger bodies of text present in Renaissance and early modern society, influences hitherto unrecognised.

Sentiment analysis is a text analysis technique that evaluates the emotional tone in textual discussions, useful for observing and comparing sentiments expressed on various topics. It has been successfully used in historical projects (Soni *et al.*, 2021) and contemporary Twitter discourse (Colleoni *et al.*, 2014; Lashari and Wiil, 2016). The ability to perform semi-automated sentiment analysis on a large corpus thus permits us to draw meaningful conclusions about the sentiments surrounding a particular topic, text or author.

Both LSA and sentiment analysis incorporate the latest machine learning techniques to detect subtle uses and discussions of ancient wisdom texts (Rani and Kumar, 2019; Dobson, 2021; Zhou, 2021). These techniques rely on careful implementation by a team skilled in both digital and historical analysis.

A multidisciplinary, multilinguistic team

The VERITRACE team, led by Prof. Dr Cornelis J. Schilt (see Project Lead), is as multifaceted as the VERITRACE project itself.

R References [click here](#)

Dr Eszter Kovács, a Postdoctoral Fellow (Philosophy), completed her PhD in French literature under joint supervision at the University of Szeged and the École Normale Supérieure de Lyon in 2008 and is pursuing a second PhD in philosophy, focussing on early modern female philosophers and metaphysical/scientific terminology. **Dr Jeffrey Wolf**, a Postdoctoral Fellow (Digital Humanities), obtained his PhD in the history of medicine from the University of Edinburgh and studied the philosophy and history of science at the University of California, Berkeley before that. He has also taught web development at Northwestern University. Doctoral student **Nicolò Cantoni** blends philosophy (University of Pavia) with screenwriting (Centro Italiano di Studi Superiori) and researches utopian thought and the interplay between philosophy, science and Abrahamic religions in the Renaissance and early modern era. **Demetrios Paraschos**, another doctoral student, specialises in Stoicism and Platonism, holding a BA in Philology from the Aristotle University of Thessaloniki and an MA in Classics and Ancient Civilizations from Leiden University.

PROJECT NAME

VERITRACE, or *Traces de la Verité: The Reappropriation of Ancient Wisdom in Early Modern Natural Philosophy*.

PROJECT SUMMARY

VERITRACE will enhance our understanding of the role of ancient wisdom writings in the development of early modern natural philosophy by employing state-of-the-art digital techniques on a large corpus of early modern texts. The project charts the spread of this discourse from Renaissance Italy to early modern Europe and identifies watershed moments in the reception of these ancient wisdom writings.

PROJECT LEAD PROFILE

Prof. Dr Cornelis J. Schilt is Associate Professor in History and Philosophy of Knowledge at the Vrije Universiteit Brussels. He was educated in physics, astrophysics, and history and philosophy of science at Utrecht University, and holds a DPhil in History of Science from Oxford University. Previously, he was a Junior Research Fellow at Linacre College, Oxford, and senior editor with the Newton Project. He has published extensively on Renaissance and early modern science and religion, with a particular focus on the life and writings of Isaac Newton, including *Isaac Newton and the Study of Chronology: Prophecy, History, and Method* (Amsterdam University Press, 2021). He is very interested in the application of computational methods to study past, present and future.

PROJECT CONTACTS

Prof. Dr Cornelis J. Schilt
Vrije Universiteit Brussel,
Department of History, Archaeology, Arts,
Philosophy and Ethics (HARP),
Pleinlaan 2 B-1050 Brussels

+32 2 629 39 05

cschilt@vub.be

<https://veritrace.eu>



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Prof. Dr Cornelis J. Schilt



Dr Eszter Kovács



Dr Jeffrey Wolf



Nicolò Cantoni



Demetrios Paraschos